

## Description

### Safety means for a vertical connection of two members

5 The present invention relates to a locking device for a vertical connection of two components, in particular for a pivot connection of ceiling-mounted medical supply units, in particular of ceiling-mounted medical stands.

Ceiling-mounted medical stands are provided for overhead mounting of medical equipment, such as medical monitors, respirators, syringe pumps, etc. They are, for example, used in operating rooms or intensive-care units, etc. for accommodation of  
10 the systems required for operations, intensive care or examination of a patient. Since all of the supply lines for electric current, compressed air, oxygen, and other medical gases, etc. can be routed from the ceiling into the ceiling-mounted stands where they can be connected directly to the equipment, the necessity of placing the cables on the floor is avoided and the risk of stumbling over cables that are lying on the floor can,  
15 thus, be eliminated.

Ceiling-mounted stands consist of a column and at least one horizontal swinging arm that are mounted to the ceiling via a pivot connection such that they can be turned, and of an equipment carrier, also called stand head, that is provided to accommodate the necessary connections and devices. The pivoted arm permits the ceiling-mounted stand to be swung across any radius desired, thus facilitating access to  
20 the patient or adjustment of an optimum working position. Coming out of the ceiling, all cables and supply lines are routed down into the ceiling-mounted stand where they are placed and from where they are routed through the pivot connection and the arm and to the stand head. The ceiling-mounted stand may also comprise two arms that are  
25 coupled to each other such that they can be pivoted.

The pivot connections must be able to carry the total weight of the ceiling-mounted stand, including the stand head and the equipment accommodated therein. Any tearing apart of the pivot connection must, under any and all circumstances, be

avoided since, otherwise, the ceiling-mounted stand would fall down, maybe causing considerable personal injury and material damage.

5 Therefore, the present invention aims at providing a locking device that reliably prevents the ceiling-mounted stand from falling down. Furthermore, the locking device should also be capable of being retrofitted to already existing systems without any considerable effort.

According to the invention, this problem is solved by means of a locking device according to Claim 1. Additional advantageous further developments are subject of the subordinate claims.

10 By forming the shell in individual shell segments and the washer in individual washer segments, it is also possible to retrofit the locking device without having to separate the cables and supply lines. Should retrofitting be necessary, the first step simply comprises sideward insertion of the washer segments above and below the pivot connection and fixing same via mounting screws of the pivot connection.

15 The engaging section of the shell segments comprises, to advantage, a ring segment section that is bent from the upper or lower edge at an essentially right angle. Thereby, each shell segment can be fitted sideways onto the pivot connection in the manner of a clamp, with the upper and lower ring segment sections simply engaging above and below the washer respectively, thus securing the pivot connection against  
20 falling apart.

The engaging section of the washer segment is formed as a stepped projection protruding from the outer perimeter of the washer segment, thus ensuring easy mounting of the shell segments. Furthermore, the manufacture of such washer segments is simple and cost-effective.

25 By the engaging section of the shell segment and the engaging section of the washer segment extending along the entire perimeter, the force to be absorbed in the event of the pivot connection tearing apart is distributed over a maximum area, so that the wall thickness of the engaging section can be kept small. Thereby, it is possible to design the locking device in a discreet manner.

The invention will be illustrated in detail below by means of a presently preferred embodiment with reference being made to the enclosed drawings, in which:

Figure 1 is a partially broken lateral view of a pivot connection and two arms;

Figure 2 is a perspective view of a shell segment;

5 Figure 3 is a top view of two shell segments that are joined to form a ring; and

Figure 4 is a top view of two washer segments that are joined to form a ring.

Fig. 1 indicates an upper arm 21 extending in horizontal direction and a lower arm 22 extending in horizontal direction, with both arms being connected to each other via a vertical pivot connection 20 such that they can be turned. The pivot connection 20  
10 comprises a hub 23 that is surrounded by two further cylindrical components not described in detail here. The hub 23 is formed as a hollow cylinder. The supply cables and tubes (not shown here) are placed in said hollow cylinder. The pivot connection 20 as such will, however, not be considered in more detail below.

In the present embodiment, the locking device for the pivot connection 20 is  
15 formed by two shell segments 1 enveloping the pivot connection and associated upper and lower washers 9 and 29 that are likewise arranged around the pivot connection.

Fig. 2 shows a shell segment 1. Since it is designed identically, the second shell segment will not be described in more detail here. As seen from above, the shell segment 1 has a semicircular shape. It possesses a shell segment surface 19 comprising a  
20 first free segment end 3 in circumferential direction and a second free segment end 4 arranged diametrically opposite to the first segment end. When installed as shown in Fig. 1, the shell segment comprises an upper edge 5 facing the upper arm 21 as well as an opposite lower edge 6 facing the lower arm 22. An upper projection is arranged at a right angle adjacent to the upper edge 5. Said projection extends inwards along the  
25 entire upper edge 5 in radial direction, thus forming a continuous engaging section 7. Likewise, a projection forming an engaging section 8 directed inwards in radial direction is arranged adjacent to the lower edge 6, also at a right angle. This radial projection extends inwards for only a few millimeters. However, the projection is dimensioned such that, by engaging the washer segments described below, it would be ca-

pable of reliably holding the weight of the ceiling-mounted stand and the equipment, should the pivot connection 20 tear apart. In the area of the segment end 3, two holes 24 through which screws can be fitted are provided in the shell segment surface 19. Two holes 24 are also provided at the other segment end 4.

5       As shown in Fig. 3, two shell segments 1 are joined to form a ring. The two shell segments 1 are connected to each other via a connection element 10 at either of the free segment ends 3 and 4. The connection element 10 consists of a plate provided with two holes corresponding to the holes 9. In the present executive form, the holes of the connection element 10 are provided with internal threads so that screws can be  
10       screwed into the connection element. It is, however, also possible to provide un-threaded holes. In this case, the screws are screwed to each other by means of a nut.

According to Fig. 1, a washer 9 facing the upper arm 21 and a washer 29 facing the lower arm 22 are provided. Since both washers are identical, only the upper washer 9 will be described in more detail below, with reference being made to Fig. 4.

15       According to Fig. 4, two washer segments 11 and 12 are joined to form an approximately closed washer 9. As seen from above, the two washer segments each have a semicircular shape. They are designed in the form of a flat disk, comprising a first free washer end 15 in circumferential direction, a second washer end 16 arranged diametrically opposite to the first washer end 15, a circular surface 17, an inner pe-  
20       rimeter side and an outer perimeter side. Several holes 18 through which screw bolts (that are not shown here) are fitted for mounting the washer segments to the pivot connection are provided in the circular surface 17. In the present embodiment, two holes are provided for each washer segment.

As shown in Fig. 4 and in Fig. 1, each washer segment 11, 12 possesses a projec-  
25       tion that protrudes outwards in radial direction and is used as engaging section 13, 14. The wall thickness of each projection is less than the wall thickness of the washer segment. In the present embodiment, the wall thickness of the projection is about half the wall thickness of the washer segment. However, the projection is dimensioned such that, by engaging the engaging sections 7, 8 of the shell segments 1, it would be  
30       capable of reliably holding the weight of the ceiling-mounted stand and the equipment, should the pivot connection 20 tear apart. The size of the projection in radial

direction is dimensioned such that its radial dimension is approximately equal to the radial dimension of the engaging section 7, 8 of the shell segment 1.

In the assembled state according to Fig. 1, the engaging segment 7, 8 of each shell segment 1, thus, protrudes behind the radial projection of the engaging section 13, 14 of each washer segment 11, 12, both at the upper edge 5 and the lower edge 6.

In the event of the pivot connection 20 tearing apart, the ceiling-mounted stand or parts thereof are prevented from falling down because, in such a case, the engaging sections 7, 8 of the two shell segments 1 come into engagement with the engaging sections 13, 14 of the washers 9 and 29, thus holding the pivot connection together. More accurately, the upper engaging section 7 is held by the projection of the upper washer 9, while the lower engaging section 8 holds the projection of the lower washer 29.

Retrofitting of the locking device will be described in the following. At first, screw bolts securing the pivot connection 20 are unscrewed and pulled out. Then the washer segments 11, 12 of the upper and lower washers 9 and 29 are inserted sideways above and below the pivot connection 20. Thereafter, new screw bolts that are longer by the thickness of the particular washer segments are fitted through the holes 18 on the circular surface 17 of the washer segments and retightened subsequently. In this manner, the washer segments 11, 12 are fixed to the pivot connection 20.

Now, the shell segments 1 are fitted onto the pivot connection 20 from the side and are connected to each other via the connection element 10 and the associated screws. As a result, the shell segments 1 envelop the pivot connection. Hereby, the engaging sections 7, 8 of the shell segments 1 engage the engaging section 13, 14 of the washer segments 11, 12, thus securing the pivot connection in the manner of a clamp.